567—110.3(455B) Soil investigation.

110.3(1) *Soil borings.*

a. Number of borings. A sufficient number of soil borings shall be made to accurately identify the hydrogeologic variations of the site. For new sites, the minimum number of borings required is 10 for sites of 10 acres or less, 20 for sites of 10 to 50 acres, and 20 plus an additional boring for every 10 acres above 50 acres for sites larger than 50 acres. Fewer borings may be needed for existing sites, depending on previous work done at the site. Also, no borings will be required in existing fill areas. The department may require additional borings based on the geological complexity of the site.

b. Depth of borings. All borings must extend a minimum of 25 feet deep and at least 10 feet deep below the water table. However, borings in proposed fill areas shall be terminated 10 feet above the uppermost aquifer or grouted to provide such separation. At least half the borings located outside the existing or proposed fill area shall extend 10 feet into the uppermost aquifer, 50 feet below the water table, or 10 feet into bedrock. At least one boring shall go 10 feet into bedrock, or 100 feet below the lowest ground surface elevation.

c. Boring method. Borings shall comply with the applicable portions of rule 567—110.11(455B). The preferred boring method is hollow stem auger, although it may be necessary to use other methods at greater depths and in bedrock. When wet drilling methods are used for boring in which monitoring wells or piezometers are installed, the drilling fluid and methods and development procedures shall be approved by and documented with the department.

d. An assurance that soil boring samples have been taken at the site. The soil boring samples must be kept by the permit applicant until the permit is issued and must be made available to the department if the department requests them.

110.3(2) *Soil samples.* Samples shall be collected at 5-foot intervals plus at every change in stratum. These samples should be obtained using a split spoon sampler and the procedures of the standard penetration test, conducted in accordance with American Society of Testing and Materials (ASTM) Standard D1586. This test simply counts the blows of a 140-pound hammer falling 30 inches on the sampler per foot penetration of the sampler. A minimum of one undisturbed shelby tube sample shall be obtained in the uppermost cohesive stratum at or below the lowest depth at which solid waste will be disposed. Shelby tube sampling shall be in accordance with ASTM Standard D1587. Samples should be clearly marked, preserved, and maintained for future inspection. Samples selected for laboratory analysis shall be preserved and transported to the laboratory in accordance with ASTM Standard D422.

110.3(3) *Laboratory test of discrete soil samples.* Laboratory tests of discrete soil samples shall be conducted to correlate strata between soil borings, obtain permeability data on each stratum, and design monitoring wells.

a. Permeability tests. Permeability tests using a constant-head or falling head permeameter shall be run on a minimum of one sample from each shelby tube sample. Each sample shall be from a different soil boring representing a different area of the site.

b. Grain size distribution. Grain size distribution tests should be conducted on a minimum of one sample from each distinct stratum. Analysis should be conducted in accordance with ASTM Standards D422 and D1140. Estimates of permeability shall be developed for each sample tested based on grain size distribution and standard penetration blow counts.